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WHAT SHOULD ELEMENTARY SCHOOL GEOGRAPHY INCLUDE AND IN WHAT ORDER SHOULD ITS MATERIALS BE PRESENTED?

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WHAT is geography and what part ought it to play in elementary school education are questions to which many diverse answers have been given.

In looking through files of the Journal of Geography as well as various reports and discussions on the teaching of geography we do not find any uniformity of opinion as to the fundamental nature of the subject, as to what it should include in the elementary school, or finally what should be the order and what the method used in the presentation of the material.

With the present unrest in educational matters, the cutting down of the time allotted to various subjects and the throwing out of much that has encumbered the curriculum, what is finally allowed to remain must be shown to be a fundamental and necessary part of the child's education.

The position of geography has been a difficult one. It has suffered much at the hands of both friends and foes. It has been criticized by those who should know better as being merely an agglomeration of facts from every science and without any individuality of its own. It has often suffered at the hands of its friends through a lack on their part of an insight into its fundamental nature, and an inability to arrange and put in practice courses which should demonstrate the importance which they claim for the subject.

We must conclude that the tendency in many quarters to cut down the time given to geography indicates that the importance of the subject in the elementary school curriculum is not understood, and that the divergence of view point brought out in discussions shows that we have not yet arrived at an agreement as to what geography is or how it should be taught.

The literature on geographic topics in our journals abounds with many valuable contributions along the newer lines of thought, and if these were put in practice we could indeed say that the outlook was promising, but when we turn to the schools, to the methods employed and the texts which are accepted without any serious criticism, we cannot help but realize what a mighty gap there is between theory and practice in our educational system.

It is not customary to demand any special training of teachers of geography in the elementary schools and the subject still remains in most of them a mere memorizing of disconnected facts. The geographies in use show but little improvement over those of a generation ago, and the general absence of objections to their use lead us to conclude that the newer views have not

aroused any wide-spread response either among the teachers or among those who have the responsibility of organizing and putting in force the work of the elementary school.

The schools of Germany have long been noted for their excellence in many respects and their methods have been widely copied in other countries. The doctrines of Herbart, Ritter and others as applied to school geography have found a practical expression in the teaching of the subject and in the text-books which place them far in advance of the teaching and of the texts employed in any other country.

In what follows I shall give briefly a number of views as to what geography is, what should be included in a course in school geography, what is the best order of presentation and what methods should be used. These are presented with the hope that they may help advance a subject which it seems to me is one of the most important in the curriculum but which is today not receiving the attention which it demands, and concerning the exact nature of which most teachers have a very hazy idea.

A definition so commonly used that it has become trite is as follows: "geography is a study of the earth and man" or in little different form "a study of the earth as the home of man." These definitions are so brief and inadequate that they fail to convey any real conception of the subject, in fact they convey a wrong one. In the first, *earth* and *man* as the two important parts of the subject are singled out for mention without giving any clue as to the relation they bear to each other or if there is any relation at all between them. We have no idea as to whether the term "earth" includes merely the physical earth or the various forms of life as well.

The second definition is equally defective in that it fails to give any clue as to the nature of the study. Man is singled out for mention as though he were outside of the subject and not an integral part. In a rational definition we should no more expect to find man specifically mentioned than any other animal, for he is included as an inseparable part from the very nature of the subject.

The definition given by Mill that "Geography is the exact and organized knowledge of the distribution of phenomena on the surface of the earth, culminating in the explanation of the interaction of Man with his terrestrial environment,"* is also open to criticism. The idea of "distribution" is not the controlling one in modern geography, and particularly of elementary school geography. Man is a part of the phenomena of the earth's surface and it is wholly superfluous to single him out for especial mention in a definition of the subject. By so doing we seem to set him off against the rest of nature in a class by himself a proceeding which does not give the right point of view.

McMurry has voiced a much more comprehensive definition when he says speaking of geography: "It deals with people in the midst of their physical

*Mill—Realm of Nature, p. 331.

social, industrial, and political surroundings."* It is not clear, however, what the point of view is. The statement might be interpreted as a mere enumeration of facts about any given group of people with no attempt to bring out the innate relationship which exists between all these facts, a relationship which constitutes the true essence of modern geography.

McMurry says in another place‡: "The study of the earth alone, its phenomena and forces, its vegetation and animals, its rocks and atmosphere, is natural science pure and simple." It seems to me that this is a fundamentally wrong conception of geography. There is just as truly a science of geography in the study of the distribution of animals, and the effect of environment upon their habits, structure and coloring, as there is of man in relation to his environment. The study of the distribution and modification of vegetable forms over the surface of the earth is true geography, although we may conceive of its being carried into regions where man does not or cannot live.

Bryce says: "Geography is a sort of great culture hall from which there opens out numerous doors, leading into apartments, each of these being dedicated to some particular one of the sciences.—All branches of knowledge which have anything to do with the earth, diverge from or are connected with geography.—Geography is the science which brings all into correlation with each other; it is the science through which you can best observe the action of each of them upon the life of man."

Guyot says geography is "the reciprocal action of all those forces the perpetual play of which constitutes what might be called the life of the globe; it should, if I may venture to say so, take up its physiology." In this definition, as far as I have been able to learn, is the first suggestion of the views advanced by Fritsche, a modern German geographer, that geography is the study of the earth as an organism. This definition given by Guyot is, it seems to me, one of the very best that has ever appeared. It gives a true conception of the province of modern geography.

The author has in another publication given the following definition—"Geography is the science of the earth as an organic whole whose parts are continually reacting upon each other"**; and again, "Geography is a study of the earth as a living organism whose parts and functions are mutually dependent." By earth is here meant the totality of the phenomena exhibited upon its surface studied in the light of their interdependence. In the definition of Guyot as well as that just given there is no occasion for singling out "man." As one of the earth phenomena he is included in the definition.

It may be said in criticism of the position outlined above that the definitions deal with the subject as a science and not from the standpoint of the schools. It should be recognized, however, that we must have clear conceptions to start with. The general lack of clean cut conceptions as to the funda-

*McMurry—Special Method in Geography.
‡McMurry—Special Method in Geography, p. 8.
**Nature Study Review, September, 1905.

mental nature of geography is the cause of much of the confusion in the elementary schools in regard to what should be included in geography and how its facts should be presented.

One of the foremost German geography teachers is Fritsche who in his paper "Die neuen Bahnen des Erdkundlichen Unterrichts," has presented a discussion on elementary geography which is the best the writer has ever seen. He looks at the subject from the standpoint of Guyot. He says—"The earth in its collective phenomena is an organism well knit together, which, like an animal or plant is continually going through changes." Fritsche has embodied his views in a series of most excellent geographies for the elementary schools.

Geography in the elementary schools should be first a study of the phenomena of the environment in their association and mutual relationship. Any fact which is studied for its own sake, because of its own intrinsic value apart from its relation to other facts cannot properly be included in the geography course, although it may be expedient at times to place them there. As the study is extended outward from the home this fundamental idea of the world as an organism forms a philosophical basis for a unity of treatment and a criterion by which we can exclude what is foreign.

Geography is not the study of the earth and man, but of an earth on which man plays his part, although an important one, in a unity of all phenomena. It is the province of science to analyze this organism and to study its parts; to dissect it and find the nature of its parts. For the child the important thing is the study of the living organism with all its parts functioning, and this is what constitutes geography.

The child does not look at himself as outside of nature but as a part of it. People and their industries, animals, birds, the solid land, the sea, the sky, hills, streams, etc., form one world of which he is a part. To learn how all these things affect each other, first in the place where he lives and then in other parts of the world, is the object and aim of his studies in geography.

We now come to a discussion of the order in which the materials of geography should be taken up. Most geographers hold that the subject should at first be perceptive. The pupil should become acquainted with and able to interpret the facts of his environment, and using this sense experience as a basis build up by the aid of descriptions, pictures and maps an understanding of other regions. This is so commonly accepted in theory that it needs little discussion here, but as a matter of actual practice in the schools of our country the time and attention given to the home region is usually absurdly inadequate. This is a relic of the older geography which was purely descriptive and in which the home had no place.

The fact that teachers are still generally untrained in the methods of home geography, and are thus unable to interpret and make use of the simple geographic materials of their environment has, together with the text-books

in use, greatly retarded the application of the newer views so generally held by those who have given the matter careful attention.

The school texts while introducing some material called home geography, which is of necessity very general in its character, adhere on the whole to the older order of topics. No matter in what part of the country a child's home may be he finds the subject developed in the same order. He is taken from New England down the Atlantic coast, through the southern, central and finally the Pacific coast states. If his home is in California the chances are that it will be slighted until after he has been over the whole circuit of our country. He not only knows little about his home which is to him the most important place in the world, but he has no foundation on which to build an understanding of lands which he has not seen.

There is not a single geography text in use in our country which has been written to meet the needs of the children of any particular section. The books are made to sell in any part of the country and thus no part receives the emphasis which it needs.

It is true that an attempt has been made to remedy this defect by the publication of state supplements. As far as the writer is aware not one of these gives anywhere near the amount of time to the home district or state that its importance demands. The state supplement does not fit in with the rest of the text and is the poorest excuse ever devised to help out our inadequate system.

With the small amount of knowledge of home geography on the part of the average teacher, the lack of any encouragement from the books in use, looking toward a more rational system, and the indifference on the part of superintendents, it is no wonder that the pupil, though he spends a large amount of time on the subject in the elementary school, goes out into life with the haziest ideas of the conditions under which he lives. He has acquired a lot of poorly digested facts about the countries of the world, which, because they are based on memory alone, and have not been worked out upon a basis of sense experience in his home region, are bound soon to fade from his mind.

It is instructive to learn how differently the geography of the home and native country is treated in the best German schools. In those of Munich, for example, observational or perceptive instruction occupies the first two years. Heimatkunde or home lore fills the third and fourth year, while geography as a formal subject begins in the fifth. The heimatkunde of these years corresponds in part to our home geography and in part to nature study.

The fifth year, except for a short general survey of the world, is wholly given to Germany. The sixth takes up Europe and the seventh the rest of the world. In the eighth year the pupils are brought back again to the Fatherland and study its commercial geography. Thus out of a total of six years, four years are devoted to the home land. All the work in geography is built around the home and Fatherland and the relation of these to other parts of

the world. The German child has impressed upon him in the most thorough manner the importance of his native land.

Anton Jahr has given in the Journal of Geography an outline of the course of geography in the Leipzig schools.* It is much the same as that in Munich. It starts with the home and gives the same intensive study to the province and native country, but the study of the earth as a globe is left until the seventh year when the pupils can better understand it.

The writer has long held that the formal study of the globe and the distribution of the main features of the earth's surface in the third or fourth year is wholly out of place at this stage. The pupil is not mentally able to grasp these relations in such a manner as to do him any good. It is sufficient that he acquire a general idea so as to be able to orient himself. Stories and descriptions of people and places in other parts, and how these are situated with reference to his home will accomplish this.

Most German schools give the third and fourth years to heimatkunde. Then follows the formal text-book work. The geographies published by Tischendorf are in five parts, of which three are devoted to Germany. The first part embracing about 300 pages is given entirely to Saxony, one of the smallest German states.

Prull gives one third of the space in his *Methodisches Handbuch* to Germany. Fritsche, whose books it seems to the writer are the best of any in the German schools, emphasizes the home land in the same manner.

In an extended article in the German Pedagogical Magazine entitled "New Paths in Geography Teaching", Fritsche while criticising certain practices in geography teaching in his own country, says, "He who thinks he can reach this high mark (speaking of culture) if he takes his children three years into foreign countries and has only one year for the observation of the Fatherland makes a great mistake and has wholly forgotten the purpose of the German folk schools."

If our thesis is correct that the home and its interests as they reach out over the world are of the most importance, then a school in New England would require quite a different course in geography from one in the Mississippi Valley or upon the Pacific Coast.

If we accept the German estimate of the relative importance of the home and state we shall have to revise our courses of study radically, and in most cases more than double the time given to them.

In taking up the geography of the United States we should pay less attention to political boundaries and more to the natural geographic regions into which the country is divided. Such a region in which the home is situated should be studied in its entirety without regard to whether it corresponds to a county or state boundary. The idea of studying groups of states forming a

*Journal of Geography, May, 1911.

natural region instead of the old artificial one has been hardly more than suggested in any of our texts. Prull, the author of an excellent series of German books for the elementary schools has made the study of "natural geographic regions" the especial point of departure.

As to the manner of presentation of the facts of geography most of the work is still descriptive and based upon the memory, although the newer texts in our schools lay more or less emphasis upon the causal relation.

Fritsche, in the article already referred to, develops out of Ritter's comparative geography what he calls the "biologic method." This is not so essentially different from the more advanced ideas of some other school geographers but is more thoroughly and carefully worked out. Fritsche would pay less attention to the outward form of geographic phenomena and develop more clearly the idea of the inward relationship. Nothing exists by itself; each thing conditions others, and all together form the earth organism. He says the teacher must not pass on too quickly to generalizations when there has been an insufficient basis in observation. Each new point of view, each relationship worked out must be tied up with what has already become a part of experience. If this is not done the new facts will remain in the air as far as the pupil is concerned and never become a part of his real knowledge.

When we come to the maps in our textbooks and to our methods of map study we find again that the Germans are far ahead of us. The maps in all our school books are far from what they ought to be and in some they are so small and indistinct as to be almost worthless.

In our ordinary method of taking up map study we forget entirely that the symbols of the map mean no more to the pupil than the hieroglyphics of an unknown language. He must first be taught to interpret these upon a basis of actual reality.

Fritsche and other German teachers rightly insist that the study of maps is useless unless the pupil first knows the landscape represented in the map through actual observation. The map is not an image of the landscape, but consists of a variety of signs and symbols standing for it, and must be translated into the experience of the pupils. The map says there is a mountain here, a steep slope there, a gentle one farther along, a river here, there a plain, there a forest, etc. The pupil has no means of translating these symbols without first having made observations upon the real things. According to Fritsche this ability must be gained from excursions, from the study of pictures and from the stereopticon. Without this basis of perceptive experience it is impossible to acquire any real understanding of maps.

An important adjunct of the German texts is the atlas of which a great deal is made. It is bound in a volume by itself which practice has many things to recommend it. There are a number of German school atlases which for distinctness and beauty of coloring cannot be excelled. There is no reason why the maps put before our children should not be as attractive as these.

The older German texts had few pictures of value, but the new ones

contain many excellent half tones. It has also become customary to introduce a number of colored illustrations which with certain subjects are very effective.

In what has been said the writer has tried to point out what appear to be grave errors in the commonly accepted view of geography, as well as some fundamental defects in the text-books and the class room methods, with the hope that if his views are not accepted they will at least arouse a discussion which will help to clarify the situation.

THE EUROPEAN WINTER AND THE WAR*

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IT IS in the eastern war zone that there has been the greatest suffering on account of the cold, and it is there that the winter weather controls have been most marked, but the dispatches from this area have given us much less information on this point than have those from the Franco-Belgian zone.

From Galicia, with its high ground and its northern exposure, came, in mid-September, the first mention of the suffering of troops from the cold, and early in October the soldiers there were already marching and camping in the snow. The Russians, well protected by their heavy overcoats, suffered little discomfort, but the Austrians, whose winter clothing had been captured by the Russians in Lemberg, were less fortunate. In the northeast the Germans seem to have been surprised by the setting in of cold weather in the first half of October, and not having heavy clothing they suffered severely. The Russians, on the other hand, were well protected, having fur caps covering both their heads and necks, and being otherwise well equipped with requisites for a fall and winter campaign. After their early attempts to crush Russia were unsuccessful, the Germans prepared for winter fighting in Poland, for the troops which went to the front late in October were well equipped with fur gloves and sheepskin coats. The Germans seem to have suffered from the cold all along the eastern battle line. They commandeered all available colthing, furs, and sheepskins, and at Lodz the great cloth factories were kept working night and day to supply clothing.

In the matter of general tactics of the war, it is unlikely that the Germans, even if they had been distinctly victorious in the east, would have thought of penetrating far into Russia, to face, as did Napoleon, the might of Generals January and February. It is probable that the early German activity against Russia was at least in part due to the desire to gain a distinct advantage before the setting in of the rigorous Russian winter. The capture of Warsaw before winter would have greatly strengthened the German line in

* Continued from p. 171 of the February number of the *Journal of Geography*.

East Prussia, would have endangered the Russian frontier, and would have had a distinct moral effect on the Poles. Further, if a large body of German troops could then have been transferred to France, a new campaign against Paris might perhaps have been attempted during the milder French winter. Whatever may have been the other reasons for the Russian advance into Austrian Poland, it is clear that this southern route into Austrian and German territory would naturally offer certain important climatic advantages. One of the reasons why Italy has so long kept out of the war is believed, by at least one authority, to be due to her desire to avoid a winter campaign.

Toward the latter part of October snow was interfering with the offensive of the Russian army in Poland by delaying the movement of its supplies. The German and Austrian troops, therefore, retreated less rapidly and made a more determined resistance. They were, however, themselves greatly hampered by a breakdown of their own supply trains. In December, the whole German Polish campaign was practically at a standstill, owing to the mild weather, which impeded the movement of guns over the soft ground and favored Russian trench digging.

The weather of the eastern war zone has been the dominant control in the campaign throughout the winter. Every spell of mild weather has been accompanied by an immediate slackening of military operations, owing to the difficulty of transportation. Every cold spell has stimulated military movements. Whenever the curve of temperature has gone up the curve of military activity has gone down, and whenever the curve of temperature has gone down the curve of military activity has gone up. To follow these seesaws of weather and military operations in detail would be tedious and profitless at this time. In January the Germans were using ice breakers on the Masurian lakes in East Prussia to make it possible for their gunboats to remain effective and to prevent the Russians from crossing on the ice. As long as the rivers were open they afforded protection to the Russian troops who were on the defensive behind them, and prevented the Germans from crossing on the ice. Zero temperatures were reported at Galicia early in January, and many soldiers have been frozen to death. There is an interesting and welcome human touch in a dispatch that, in Poland, by mutual agreement, neither side fired on the men of the other who were carrying straw to make their winter quarters in the deep trenches more comfortable.

The Russians are more accustomed to severe cold than are the men from the west and south of Europe, and it was reasonable to expect that they would prosecute the war with little diminution of energy during the winter. They are splendid cold weather fighters. Their midwinter military maneuvers each year have taught them cold weather tactics. Von der Goltz also, when German commander in eastern Prussia a few years ago, conducted experimental winter maneuvers along the lines followed by the contending armies in the

campaign of 1806-07 in that region, a campaign the horrors of which Von der Goltz has himself depicted in his book, "Jena to Eylau."*

The most dramatic achievements of the winter thus far have been the marches of the Russian armies over the mountain passes of the Carpathians, deep in snow. Fighting among the spurs and in the passes of the Carpathians has been terrific, and carried on under extraordinary difficulties of severe cold, and bitter winds, and heavy snowstorms. Often the troops had to cross, waist deep, the icy waters of the mountain streams. The sufferings from frost bites and exhaustion are reported to have been terrible. When we hear of snow three to six feet deep in Serbia it is not difficult to understand why Austria tried to crush Serbia before winter came on.

In the French and Belgian war zone the advances and retreats have seemed more like the tactics of a football game than of a war. It is impossible to follow the details in the present discussion. It has been a seesaw of weather and military operations, much like that in the east. The "autumn chill" of the nights and early mornings of late September in the western war zone roused the commanders to a realization of what was coming. On all sides there were sudden preparations for winter. The German Crown Prince telegraphed to the Emperor for winter socks and underclothing for his men. Germany ordered sheepskin clothing and fur coats from Rotterdam. The French minister of war sent a circular to all the prefects requesting them to obtain, as rapidly as possible, supplies of woolen underclothes, socks, gloves, and blankets for the use of the French soldiers during the winter. England made special provision for her Indian troops in the way of mufflers and warm underwear; commandeered large quantities of woolen goods, and imported from this country rubber boots and cardigan jackets. From the United States the different nations have bought immense quantities of sweaters, woolen socks, gloves and underwear, blankets, paper vests, woolen boots, and millions of horseshoe calks. The fact that this war is being fought in the winter means hundreds of thousands of dollars to the manufacturers of winter supplies in the United States.

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*Petre, describing the night before the battle of Eylau, says: "It requires a strong effort of the imagination to picture the horrors of that night. The valley and the heights on either side, deeply buried in snow, were lit by the bivouac fires of 120,000 men. The flames flickered in the icy north wind which swept along the position, carrying with it the smoke from the damp wood and the constantly falling snow. Not even the pale light of all these hundreds of fires could impart warmth to this arctic scene. The men crowded round the fires for warmth, hardly for rest; for what rest was possible in such circumstances? Between the opposing lines of fires stood the outposts of the armies and the sentries, who, on their cheerless posts, must have thought with envy even of their companions behind them. The battle was fought in a winter tempest. The snow prevented the commanders from seeing their troops, the howling north wind rendered it impossible for the soldiers to hear the word of command. At times it was not possible to see ten yards off. The action at such moments had the character of a night attack." Von der Goltz says that the Russians were not allowed to have fires lest these should betray the position of the troops.

The cold and rain and snow and sleet brought by the winter storms have made life in the trenches desperately wretched. Standing or sitting in ice cold water or "half frozen slush," and trying in vain to keep reasonably dry and warm, the troops have suffered terribly. Frozen hands and feet, and deaths by freezing, have been reported from both sides. The snow and cold made it necessary to shift the men in the trenches oftener. There was a marked increase of illness, especially of throat and lung affections. Every device was resorted to to make life in the trenches more bearable. The bottoms of the trenches were covered with straw and brush; fires were built, for which coal and coke were supplied when possible; oil stoves and braziers were used; corrugated iron roofing, the doors of houses, and planks were put over the trenches, and interlacing branches of trees were made into a rough sort of wicker work to prevent the embankments from crumbling away. The troops protected themselves with blankets and waterproof sheets, and guarded against the cold by wearing sheets of paper under their uniforms. Dugouts were cut under the sides of the trenches for the men to sleep and take shelter in. These refuges were raised somewhat above the bottom of the trenches, so that they were dry in wet weather.

The difficulties encountered in trying to move heavy guns through the deep mud and "slush" of Flanders were often unsurmountable. When the heavy guns had to be abandoned, lighter ones were substituted. Moreover, the frequent changes in the weather caused serious trouble. A day of cold froze the ground and facilitated movements of the troops and supplies, but at the same time often interposed serious obstacles in the way of great stretches of ice, on which horses and motor trucks were useless. Thousands of men were engaged at such times in throwing earth over the ice to prevent interruption of the transportation of supplies. Then a few days of mild weather and of rain turned the roads and fields into quagmires again. Great efforts have been made by both sides to keep the roads in condition for motor traffic. In a French official statement issued Jan. 4 we read: "In general, the perceptible abatement which can be noted in our active offensive should be attributed to the incessant rains, which soak the ground and make operations everywhere almost impossible." Under such conditions food supplies could not be sent forward to the troops.

About mid-November a severe westerly storm, with rain and high winds, swept the waters of the North sea far inland through the big locks at Nieuport ,which had been opened in order that the German advance over the lowlands might be checked. Thus the heavy rains and high winds helped the allies. In some cases the Germans were absolutely cut off by the floods, and were reported as literally washed out of their trenches. Fighting in water was an every day affair, and when the men were completely exhausted with fighting and with the cold, and when the weather was at its worst, hostilities temporarily ceased.

The whole period from Jan. 5 to 15 was marked by wretched weather—rain, snow, wind, fog, and mud, and all operations slackened. The French retreat across the Aisne at one point about the middle of January was reported to have been due to the fact that bridges had been carried away by floods and the allies' lines of communication were endangered. In one dispatch it was reported that, although the allies were in a bad plight, they had the consolation of knowing that their enemies were in a worse plight, for the latter had the wind and rain in their faces. This was the rainy westerly wind, directly off the water. One advantage of the soft ground for the allies was that the German howitzer shells sank some depth before they detonated, and much of their energy was therefore spent upward, throwing the mud about. Washing and shaving were impossible in the trenches. Water bottles froze and had to be thawed out.

Foggy and misty weather has frequently played its part, hampering the action of artillery on land, and again and again caused a cessation of hostilities. As a curiously unexpected meteorological phenomenon came the report, Jan. 13, of a sandstorm in the dunes along the coast. In the last week of October snow fell in the Vosges in considerable amounts, and also at several points along the French frontier. By the middle of November temperatures below freezing were reported all along the western battle front. And early in December the advance guards in the passes of the Vosges were fighting in snow two feet deep in the rigorous climate of those mountains. Early in January the French Alpine troops charged down the slopes of the Vosges on skis and routed the enemy.

The French colonial troops, especially those from Africa, are stated to have been "benumbed by the cold." While, in general, the troops from warmer latitudes may be expected to suffer more from cold than those from farther north, there are many cases in history which contradict this expectation. When Napoleon went to Russia his French troops endured the cold better than did the Poles and North Germans. In the Balkan campaign of 1877 the Russians suffered more than the Turks. Over and over again men from colder climates have not proved themselves superior in prowess or endurance to the men from more genial latitudes. In the present war we should remember that the Gurkha Indian troops are essentially highlanders, and by no means incapacitated for hard marching and fighting in the cold.

There are many respects in which the weather is of more importance in warfare today than it ever was in the past. The use of searchlights and aeroplanes in directing ordnance fire, and the greatly increased mortality caused by modern artillery, make the protection of troops, in trenches or otherwise, of essential importance. A low cloud, a fog, a snowstorm, a heavy rain, may give just the protection needed and yet not interfere with the free movement of troops. In this very war the surrender of Namur was hastened by a heavy

fog, which enabled the Germans to plant their siege guns in a good position and without danger to themselves.

In the matter of aeroplanes and airships warfare is far more dependent on weather conditions than it ever was. It seems to be a fairly well established point that in order to have his reconnaissance of real value the observer in an aeroplane must, unless the weather is unusually clear, come down low enough to be in danger from gun and rifle fire. Fogs and low clouds obscure the surface from an aerial observer. Wind may wholly interfere with his work at a time when his report is most needed. The increasing numbers of London fogs with the coming on of autumn led to great anxiety in London on account of possible Zeppelin attacks. Tests were made at the end of September to ascertain whether searchlights can detect a Zeppelin even through a fog. A warning was issued by aviation experts to the effect that an attack on London was most likely on a clear, calm night. Foggy and misty weather, cold, and high winds have hampered aerial reconnaissance, but the aviators of both sides seem to have carried out successful work in spite of the winter storms. When, however, bright calm days have intervened between the stormy spells, the advantages for the aviators have always been mentioned in the dispatches. That the airmen have suffered from the cold is evident from the fact that they have been obliged to come down because of frozen feet and hands.

In the wintry gales over the channel and the North Sea England probably has had her most valuable ally against a general Zeppelin raid, but the intervals between storms may yet prove the Germans' opportunity. The German aeroplane which dropped a bomb over Dover in late December "escaped in the mist" from the British aeroplanes which pursued it. In the Christmas day aerial raid by the British upon Cuxhaven the atmosphere was so thick that it was difficult for the airmen to achieve their purpose. It is obvious that a fog gives aviators their best chance of safety, but, on the other hand, they cannot pick out their targets. In the German air raid of Jan. 19 a mist prevented the airmen from aiming their bombs with accuracy, and also prevented effective pursuit of and successful shooting at the invaders.

It is not difficult to realize how serious the lack of a daily European weather map must be in the whole aerial campaign. Germany in particular, if she plans a general Zeppelin raid on England, must find the lack of observations from the British Isles most serious. German meteorological observers followed the German army closely in Belgium, and meteorological stations were at once established at Brussels, Ostend, and Zeebrugge. These observers have doubtless been issuing local weather forecasts for the use of the military staff.

So far as the naval side of the war is concerned, there has thus far been little to note on the meteorological aspects. With the approach of winter, and the increase of stormy weather over the northern seas, it was reasonable to expect losses due to gales, and thick weather, and fogs, and to suffering from

the cold. Rough water and fog make the approach of a submarine difficult or impossible to see, and therefore help the attacking vessel. Submarines do their best work in the worst weather. We note that the weather was "bitterly cold" at the time when the British cruiser Hawke was torpedoed, so that the chances of saving the men who were struggling in the water were greatly lessened.

Special precautions must be taken to guard against collision, shipwreck, and submarine attack in winter. The German fleet has perhaps been waiting for a winter gale to scatter the British ships. On Dec. 5 the British cruiser Venus was driven ashore in one of the winter storms. A spell of foggy and misty weather was chosen for the German raid on the east coast of England in mid-December. Such an expedition was to be expected as soon as the winter storms made it more difficult for the English ships to maintain a close blockade. According to English reports, a half hour and a fog saved the German squadron from annihilation. Fog also played a part in the naval engagement off Cuxhaven late in January.

Fogs over the water and land have several times prevented the shelling of the German trenches by the allied fleet, whose gun fire on clear days has been so effective. It is obvious that the navy whose vessels can remain safely in port has the advantage over the one whose vessels are doing patrol duty on a stormy sea. Should there be a naval engagement after a severe gale, when the British fleet has been disorganized and scattered, the advantage, other things being equal, would lie with the Germans, whose crews would be fresh and whose vessels would be in the best condition, coming directly from the harbor. Archangel, which has served as an important port for the allies, was kept open by means of ice breakers at least as late as the first week of January.

It is a notable fact that the Japanese and English fleets advanced to the attack of Tsingtau under the cover of a mist. Further, the naval engagement off the coast of Chile early in November was fought in the teeth of a "norther" which "reached hurricane strength." Small boats could not live in the rough sea and hence there was great loss of life. The heavy weather put the larger ships at a disadvantage. The Good Hope found her guns almost useless because of the ship's rolling.

From the Asiatic war area we have had rather few reports regarding the climatic obstacles in the war. The well known extreme winters of the Armenian highlands made it clear at the outset that but little progress would be made by either side in that particular region before spring. One report says: "Clad in every variety of garments to keep warm, including Turkish robes and wide flowing Kurdish coats, the Russians are huddling in every shelter hut, and in the farm houses, cow sheds, stables, and storehouses. Wherever possible the roofs have been cut out so that bonfires may be safely built within." Frequent mention has been made of the cold and the snow. In the crushing blow which the Russians dealt the Turks early in January, Caucasia,

three days of the battle were during a violent snowstorm. The Turks fought against great odds, for the roads along which they had to retreat were blocked by deep snows, which necessitated the abandonment of many cannon and supplies. The Turkish army crossed the mountains at high altitudes in spite of zero weather. Hundreds of Turkish bodies were found frozen in the snow.

A strong Turkish movement, with heavy artillery, to the Suez canal is bound to be difficult and slow, by reason of the intervening desert. Of all the obstacles which stand in the way of a marching army, a desert is one of the greatest. There is the difficulty of supplying water and food and of moving the guns through the sand. The Turks have realized that a desert is more readily crossed in winter than in the heat of summer, as is evidenced by their activity near the canal toward the end of January. In expectation of the coming of the Turkish troops the English had filled up many wells in the desert.

Thus throughout the area of the great war the weather from day to day is playing its part in the campaign. Modern military tactics, modern armament, modern methods of all kinds, have not in any way eliminated the weather element as a factor of the greatest importance. The story of the present war does not, thus far, read very differently from that of previous wars in the same countries. In 1586 the Spanish, as related by Motley, encountered such terrible rains on the Meuse that they retreated. A previous fall of Namur, in 1692, was largely due to heavy rains which prevented the English from crossing the river and meeting the besieging French army. The English in Flanders in 1708-9 endured great hardships on account of deep snows, which blocked the roads. The cold was intense and the troops, who were short of firewood, suffered severely. The Duke of Marlborough wrote (1708): "Till this frost yields we can neither break ground for our batteries nor open our trenches." The French, in Poland, in 1806-7, found mud three feet deep, drenching rains, driving sleet, melting snow and icy streams. In the Franco-Prussian war of 1870-1, over the same historic ground in France, we read of torrential rains, floods, icy roads, muddy fields, and the suffering on account of cold.

So the story goes on, from age to age, from one war to the next. War and the weather: they are related today, as they were in the past, and as they will be until war shall cease.

GEOGRAPHICAL FACTORS IN THE AGRICULTURE OF DU PAGE COUNTY, ILLINOIS

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THIS discussion of the agricultural geography of a prairie county in Illinois is presented as a type study from the Middle West. It is part of a dissertation submitted to the faculty of the Ogden Graduate School of Science of the University of Chicago in candidacy for the degree of Master of Science in 1911*. Acknowledgement is due Prof. H. H. Barrows, under whose direction the thesis was written.

Du Page County is in the northeastern part of Illinois just west of Chicago. Its area of 339 square miles is underlain by Niagara limestone, which is deeply covered by glacial drift. The drift, with an average thickness of 100 feet, covers an irregular bedrock topography. For details regarding the geography of the county, and for references to the literature, see the complete copy of this thesis, Geology Library, Rosenwald Hall, University of Chicago, and The Geology and Geography of the Wheaton Quadrangle by A. C. Trowbridge, Ill. Geol. Survey, Bull. 19, 1912. Special reference may be made to the manuscript letters of Mr. and Mrs. Daniel M. Greene, from Lisle Township, Du Page County, written between 1835 and 1878, and of Mrs. Strong's, written between 1830 and 1850.

Du Page County from the beginning of settlement has been devoted chiefly to agriculture, for which it is well fitted. The topography of the county is flattish or gently rolling with slight relief and moderate slopes which can be cultivated easily. It lies in a section having a mean annual rainfall of 36.25 inches with a recorded minimum of 29.8 inches in 1900 and a maximum of 45.4 inches in 1898. The rain is usually well distributed through the year. Occasional drouths, however, do immense damage to crops. The county is well supplied with ground water. The farmers depend chiefly for their water supply upon shallow wells, most of which furnish excellent water at depths of twenty to forty feet. For a county with fair-sized prairies, Du Page was well supplied with timber, well distributed and sufficient in amount to meet all the needs of the early settlers.

The soil of Du Page County is deep and rich, and, being made from the underlying glacial drift, contained all the elements of plant food in suitable amounts. It consists of three general varieties,—the upland prairie soil, the upland timber soil, and the lowland alluvial soil. The alluvial soil is found along the river bottoms and in small patches throughout the ground moraine where there were formerly little lakes or swamps. This soil is black and rich. The soil in the swamp areas is in many places so full of vegetable material that it is not very good for agriculture, unless potassium is added. The upland timber soil is in most places heavy clay, and poor for everything except small grains and

*The two following paragraphs are abstracted from the introductory pages of the thesis, where the general geography was discussed at greater length.

hay. This soil was cultivated first, in the clearings of the timber, and as it was fairly good for wheat, especially as long as the layer of leaf mold lasted, it was supposed to be the only soil suited to that cereal. Soon, however, it was found to be inferior to the prairie soil. It occurs for the most part on the higher ridges and now, even where the timber has been cut off for a number of years, it can be told from the original prairie soil by its lighter color, its stickier character, and the presence of black iron. The prairie soil is the black upland soil. It is usually underlain by brown loam, and was originally about as fertile as the alluvial soil.

The prairies excited the wonder of all travelers and settlers in Du Page County, as in other parts of northern Illinois. They were covered with tall, coarse grass which turned yellow at one stage, quite resembling young wheat. In the damp places the grass grew rank and often nine feet tall. On the upland rolling prairie it was about eighteen inches high, with a compact mass of roots forming a dense sod. The prairie flowers were the inspiration of many early poems and, judging from the descriptions of travellers, they must have been brilliant in the extreme. The prairies, with their covering of long grass undulating in the wind, were often likened to a great sea, out of which groves of timber rose like islands. Every year the Indians set fire to the prairies (1) to drive the game to the timber, (2) to facilitate the speed of their horses, and (3) to afford no cover for enemies. Even after the Indians departed, prairie fires often were set by those who believed that the layer of ashes over the prairie was beneficial to the soil and that it would aid the next year's growth of grass.

The prairies were very useful to the immigrant and settler. They afforded fodder for cattle and horses and made the planting of hay unnecessary for a number of years. This was of primary importance because of the difficulties of producing crops on only a few acres, so if hay for the cattle had had to be procured too, it probably would have meant decrease of the herd and a consequent loss of meat, milk, butter, and cheese, which were the mainstays of the early households in Du Page County.

Cattle were brought from the East or imported from the South. The price of good milch cows in 1836 in Du Page County was $25.00 and in 1837, $25.00 to $40.00, and they paid for themselves in one summer. The farmers turned as many cows as they pleased on to the prairie and cut enough prairie grass to last through the winter. In Du Page County agriculture was more advantageous than stock raising, so the number of cattle held by each pioneer farmer was usually only enough for his own use, and no products were sold, except butter occasionally.

Many settlers could not wait until the sod was disintegrated to plant a crop, and so raised "sod corn" and "sod wheat." This meant hewing apart the sod with an axe or spade, dropping corn or wheat into the cracks, and "applying the heel freely." This was not always a certain method of raising a crop. In some cases seed had to be planted several times because prairie chickens scratched it up.

Agriculture in Du Page County is naturally divided into three periods, (1) from 1830 to 1850, (2) from 1850 to 1870, (3) from 1870 to the present.

Corn was the staple crop of the pioneers of Du Page County. It was easily raised and afforded large returns for time and labor expended. It had a long harvest season, which was important as labor was often scarce. It was fed to the stock in winter, and constituted the main, and at times the only, article of diet for all early households. It could be ground at home, and used in various forms such as mush and hominy, corn bread, corn cakes, etc. It was easily stored and handled, but was too bulky to be transported far.

Next to corn, wheat was the chief crop in early days. At first many plants from fall-sown seed were winter-killed, and so spring wheat was considered the surer crop. Toward the end of the period, the chinch bug destroyed much of the spring wheat, so winter wheat came into favor. Oats followed wheat in importance, and some barley, buckwheat, rye and flax were raised. The New Englanders had excellent gardens and orchards. Most of the common vegetables and fruits were raised, the seeds being imported from the East. Melons seemed particularly adapted to the prairie soil in Du Page County, and excelled any that the Easterners had known before.

Farming operations were hindered at this early day by lack of implements. The New Englander as a rule was supplied best, his stock usually consisting of an axe, plow, and scythe which he had brought with him from the East. The plows were clumsy affairs of cast iron, which plowed only four or five inches deep and in such a way that almost one-third of the land was not benefitted. They had to be guided by hand, and a man walked twenty-five miles and more a day while plowing one and one-half or two acres. Corn was planted by hand and covered with a hoe until, toward the end of the period, a hand planter was introduced by which planting and covering were performed in one operation. Small grain was sown broadcast by hand and harvested with sickle or scythe and cradle. Threshing was done by flail on the barn floor.

All the methods of agriculture in this period are characterized by crudeness and waste. The farmers believed in the inexhaustibility of the virgin soil and thought that the rotation and fertilization practiced on the worn lands in the East would never be necessary on their fields. The great yield of the prairies is probably responsible for these ideas. The first crops, even with the fields only partially broken, were about as large as our average yields of today, with all our advantages of modern agricultural methods. A letter written from Du Page County in 1835 states that much of the corn was twelve feet high, while eight to nine feet was the average, with ears often six feet from the ground; the yield was forty bushels per acre. This crop was raised by the writer the same year that he came west, so it was presumably sod corn. Later we have reports varying from forty to eighty bushels of corn per acre. While allowance should be made for the exaggeration of early re-

ports, yet the average for the county probably was at least twenty-five per cent higher than now. An ordinary first crop paid all the expenses of breaking, plowing, harvesting, and marketing.

Until 1838, farmers in Du Page County reaped large profits from their farms. The supply of produce never quite equalled the demand. New settlers bought of those who had come before. Immigrants and speculators were arriving in such numbers that the demand for farm produce in Chicago and in the taverns along the trails made prices high. In 1836, work began on the Illinois and Michigan Canal, and this offered another market for the Du Page farmer. In 1835 corn was $1.00 to $1.25 a bushel, wheat $1.25 to $1.50, oats 90c to $1.00, potatoes, 50c to $1.00, flour $10.00 to $15.00 per barrel, and pork $15.00 per barrel. In April, 1837, wheat reached $2.00 a bushel. The panic of 1837 affected the price of produce and the decline continued until 1843. Work was suspended on the canal and money was so scarce that trade was carried on chiefly by barter. All produce was extremely low in 1843. Pork was sold at $1.50 and $2.00 per one hundred pounds, the lowest to that time in Chicago. In 1844 corn was only 25c a bushel, but increased in value from then till 1850. Pork and beef did not begin to rise on account of a slight overproduction until the famine in Ireland (1846 to 1847) called for all the grain the West could produce. In 1850 pork was selling for $4.00 or $5.00 a hundred pounds. Although corn was raised chiefly for home use, it was found profitable to sell at high prices. There was a difference of 25c on the price of produce in Du Page County and in Chicago. Wheat was raised chiefly for market, although some was converted into flour for home use. Potatoes were marketed in this period and often a calf or hog was found on the farmer's wagon as he drove to market. Some wool was marketed, but not so much in this period as later.

Most of the produce was carted to Chicago. An early start with good roads would bring the Du Page County farmer into Chicago in time to market his produce the same day. A bridge was built in 1847 over the Des Plaines River at the site of Maywood through the efforts of the Du Page County farmers, who insisted on marketing their produce even during high water.

Scientific agriculture began in Du Page County between 1850 and 1870. The introduction of the reaper probably was the most important advance in farm practice at this time. McCormick reapers were an assured success after 1851, and Du Page County, being near the factory, early benefitted by this invention. Two laborers were required at first, one to manage the horses and the other to rake the grain off the machine. During the Civil War the invention of the raking apparatus dispensed with one laborer.

Cast iron plows gave way to self-cleaning steel plows. Broad-cast seeders were introduced and also wheeled harrows, which were later adapted to riding. Windmills for pumping water became common during this period but were clumsy affairs made of wood. There were a few windmills of Dutch type for grinding flour. Corn-planters were improved to plant two rows at a time.

Threshing was still done by flail and husking by hand. The invention of the sectional plates for the straight sickle edge of the reaper made it as good for cutting grass as grain. The value of farm machinery in Du Page County increased from $86,013 in 1850 to $204,110 in 1860, and $307,498 in 1870; while the population increased in the same time from 9,290 to 14,701 and 16,685. Thus the per capita value of farm machinery increased from $9.15 in 1850 to $18.13 in 1870, or nearly 100 per cent.

Stock raising became more and more important during this period. The rapid settlement of the prairies by the Germans created a demand for horses and cattle. Cattle and sheep also were raised for the meat supply of the county or sold to the slaughtering houses of Chicago. Wool was high in price and the production of the county increased from 34,034 lbs. in 1850 to 153,611 lbs. in 1870. The rapid decline of sheep raising after this date was due to the development of the more profitable dairy industry, so sheep raising had to be transferred to cheaper land. At present there are only 836 sheep in the county, compared with 26,932 in 1870.

The county is well adapted to stock raising. The prairie soil produces excellent fodder, and the upland timbered areas are good pasture land. The number of milch cows increased rapidly, because of the increase in population, and a great quantity of butter and cheese was made. This was the time of greatest output of these products in the history of Du Page County, yet it was all made on the farms. It was usually sold to the country stores but sometimes shipped to Chicago.

The character of the crops changed during the period. With the settlement of the prairies the area of pasture land decreased and hay had to be grown increasingly. Some rye and barley were raised and sold to the breweries at Naperville. Grain farming as a whole declined. Corn and oats were the staple crops but were raised chiefly for feed. Wheat was often unprofitable as it was attacked season after season by rust, mildew, and insects. Fall-sown wheat for a number of years was winter-killed, and so was abandoned altogether by the end of the period.

The opening of the Illinois and Michigan Canal made it possible to take lumber into the interior in large quantities and made Chicago the greatest lumber market in the country. A reduction in the price of lumber followed, much to the benefit of the farmer who was now taking up prairie land a number of miles from the timber. It also led to an enlarging of agricultural operations and the building of commodious barns and houses.

Because of the panic of 1857 prices fell in 1858 and although they recovered to a certain extent the next year they afterwards continued to decline until just before the Civil War when they reached a very low figure. In 1861, wheat sold for 75c and corn for 23c a bushel.

During the war, food was needed for the armies, and the withdrawal of labor made prices advance until in 1864, wheat was $1.81 and corn $1.30

a bushel in Chicago. After that prices declined, except for wheat. The price of the latter was kept up by the foreign demand and its growing scarcity around Chicago. Such a reign of high prices while crops were unusually good, gave the farmers of Du Page County and other places away from the scene of battle, an unusual opportunity. Increasing use was made of farm machines because it not only added to the acreage which a man could cultivate by himself, thus increasing his income, but because it was necessary on account of the absence of so many laborers. Such an era of agricultural prosperity during a great war has no counterpart in history and at the end, instead of the land having depreciated in value in the North, it had risen on an average $5 an acre.

The period between 1850 and 1870 was one of transition, due to the tremendous changes brought about through the medium of railroads. They facilitated the settlement of the prairies, the movement of lumber, machines, and manufactured articles into the country and that of farm products to the city. Under conditions of rapid transportation only, could the dairy industry have developed. The competition of the cheaper western grain in Chicago markets discouraged its production near Chicago. By the end of the period the farmer had gradually adjusted himself to the new conditions which inaugurated another period.

There was notable development of agriculture from 1870 to 1911. The first really scientific plow appeared about 1870. This was light in weight and shaped to cause motion between the particles in the furrow. The first plows had only scratched the surface; the breaking plows with their long, twisted mold boards simply turned the sod and at the same time compacted the subsoil, while the heavy plows of the previous period turned the furrows without loosening the soil particles. Modern plows are (1) adapted for riding (2) combined to do many times the work of one, and (3) adjusted to different kinds of power. For Du Page County the sulky and gang plows are most efficient. Some farmers are adapting gasoline engines to plows as well as to other machines.

Broad-cast seeders have given place to drills which plant and harrow in one operation. Disk drills are the most common, and even corn is planted in this way when used for fodder. Corn harvesting is not yet completely mastered by machinery. There are machines for cultivating, husking, cutting, and shredding corn and stacking it in silos. A great deal of corn is cut while still immature and carried directly to the pastures when they begin to fail in the summer.

Grain harvesters were improved greatly after 1870. An adjustment was made to lift the grain to a table by which two men stood to bind it into sheaves. In 1875 the automatic binding was done but with wire which gave way later to twine. Formerly the bundles were tossed out as fast as bound, but an attachment for holding and delivering bundles at intervals made the shocking less work.

Threshing machines were introduced, and were run first by horse power and later by steam. The grain and straw were expelled together and had to be shaken apart and the straw stacked by hand. Now the threshing machines deliver the cleaned grain in one place and expel the straw by a pipe which can be regulated to build a stack of any size or shape desired. Threshing machines travel through the county from the first of July to the end ot summer, often visiting the same farm twice, for winter wheat and later crops.

Many farmers are cutting grain as high as it can be conveniently harvested so that the straw which was formerly wasted will be left in the field. This they turn under, improving both the physical and chemical properties of the soil.

Hay harvesting machines have become important within the last 25 years, particularly the hay loader. This gathers the hay directly from the swath and loads it on the wagon. Hay forks in the barns greatly facilitate the handling of large crops. Some hay is baled on the farm and shipped to Chicago. This is usually done in the spring to make room for the new crop.

Steel windmills have replaced wooden ones and are now found on practically every farm. The exigencies of the dairy business make it necessary to have cold water for cooling the milk. Sometimes the wind is not blowing and the farmer needs some other motive force for his pump. For this reason a number of farmers are installing gasoline engines which when used for cream separators, for running farm machinery, and for pumping water, are very economical.

The saving in time and money brought about by modern agricultural methods and machines is shown by comparing the labor and time required for the early crops and for those of the present. In 1830 an acre of wheat took an average of 64 hours, 15 minutes of labor and cost $3.71, while in 1896 it took 2 hours, 58 minutes and cost 72 cents. In other words, the production of one bushel of wheat took 3 hours of labor in 1830, and 10 minutes in 1896.

In 1880 the average number of acres which could be tended by one man was 23, while in 1900 it had risen to 31 acres. The value of product per person had increased in the same time from $286.82 to $454.37.

The growth of Chicago and the improvement of railroad facilities are responsible for the growth of the dairy industry in Du Page County. It is part of a great industry extending out 65 miles, and more in some directions, from Chicago. It is favored by the relatively cool climate and the good soil. It was encouraged by the decrease in grain farming and the increased attention to stock raising. The demand for fresh milk in the city made its production more profitable than that of butter and cheese. About 1870, factories were built which by their efficiency took over the butter and cheese production of the whole county. They prolonged the life of the butter industry for a decade, but the amount of cheese produced declined very rapidly, as the milk pro-

duction increased. The removal of butter production from the farm has led to a more uniform product of higher grade, especially since the introduction of the cream separator in 1878. The factories now buy any excess milk produced and convert it into butter for the farmer and the town trade. In nearly every town there is a small butter factory, but there are very few cheese factories in the whole county.

The production of milk has been the dominant interest in Du Page County for 40 years, and probably will continue to be as long as Chicago continues to grow or until the land is needed for city uses. It is a permanent and profitable business because the demand is constant and because it does not depend on favorable legislation; furthermore, it benefits the soil. It has led to the improvement of the country roads and has removed by so much the isolation of the farm.

Du Page County has gradually increased in milk production until now it is one of the greatest milk producing counties in northern Illinois. Since 1900, the amount of milk shipped has decreased, because of the increasing amount which is separated on the farm. A number of separators have been installed in the county and are very profitable, since the farmer can use the skim milk for fattening calves and hogs. The cream production rose from 90 gallons in 1900 to 13,000 gallons in 1910.

The milk is hauled to the railroad every morning and shipped to a distributor in Chicago, who has it tested, bottled and ready for distribution in the afternoon and next morning. The regulation concerning the inspection and testing of all milk distributed in Chicago has done much towards making the output of standard quality. Now cement floored barns are common, while white-washed walls and improved sanitary conditions are the rule.

New Topographic Map of Cincinnati

An excellent example of a topographic map is that which has just been issued by the United States Geological Survey of the city of Cincinnati and environs—an area of over 400 square miles in Ohio and Kentucky. The area includes Ohio River from Tenmile Creek in Pierce Township, Clermont County, Ohio, to the town of North Bend in Miami Township, Hamilton County.

All railroads, electric roads, and principal and secondary wagon roads as well as bridges, canals, and other works of man are shown in their exact relative position. Surveyed in such detail and published by private enterprise this map would doubtless have to be sold for $5 to $10 a copy, but it can be obtained from the Director of the Geological Survey, Washington, D. C., for 20 cents.

CAPE VERD ISLANDS; A VISIT TO SAN VICENTE IN 1890

By Mark Jefferson
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WE were steaming through an expanse of long oily swells off the West African coast. The awnings and the Aquila's sixteen knots an hour alone saved us from scorching between the tropic sun and its reflex in the glassy sea. All the afternoon there had been a haze to the north-east, where Captain Lavarello said we should sight San Antonio about six o'clock. This had been a source of great expectancy to all the passengers, as we had seen no land since leaving Fernando Noronha, off the Brazilian coast, and were all ready to hail the Cape Verde Islands as a variation of our daily scene of sea and sky. However, just as the gong rang for dinner, came the expected cry of Terra. Sure enough, the haze had cleared away and there, somewhat to the northward of where we had been gazing, rose a faint blue cloud far into the sky. There was nothing definite about it to look at long, so, after expressing doubts as to whether land could be so high, we went to dinner.

You see many of us had lived beside the lofty peaks of the Andine system; yet the effect of the mountain heights, where they rise sheer from the ocean, is so surprising that Aconcagua's twenty-two thousand feet seem less actually than San Antonio's five or six thousand. You may see the same effect in Green Mountain, Mt. Desert.

That night little more was to be seen than the lights of the Port and the village of San Vicente. We had to defer our sight-seeing till morning. Then we found ourselves lying in a circular bay, nearly surrounded by queer red and black crags of volcanic rock. Here and there a beach or hillside of bright yellow sand varied the scene, while to the right of the town, a long hollow swung back from the bay, carpeted with what seemed at first sight low firs, but on nearer approach, turned out to be plants peculiar to the islands. They are apparently maintained by the moisture of an underground water-course that follows the hollow.

Excepting a fine double row of shade-trees on the street along the water front, this is all there is of green on the island, fruit and vegetables being brought from San Antonio, that looms blue and hazy before the entrance to the harbor.

Nearer, dividing in two the harbor's mouth, stands an odd-shaped jagged rock, bearing the chief lighthouse high above the waves. The whole rock foundation of the island is so soft that the sea and weather readily work it into fantastic forms. The most notable illustration of this fact is seen looking seaward from the centre of the town. It is a huge face profiled in the hill-tops, gazing skyward. We climbed some lesser heights behind the town and

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The above notes were written down in 1891, one year after the event, excepting the parenthesis near the end, which I am adding from memory.

found the firmest of the rock crumbled beneath our feet. Driven down to the shelter of the town by the sun's glaring rays, our attention was attracted by the throng about the public well, and we stopped to peer in. Without, it is a circular structure of volcanic rock, faced with lime, as are all the buildings on the island. Walled up for about ten feet from the ground, open arches, supporting the broad roof above, allow a free circulation of air within. The building is about thirty feet in diameter and is entered through a broad door to the north. Within, the actual well occupies the centre, being enclosed by a parapet about breast high opening on the side side to a sort of balcony over the water. There the women stand to lower their cans to the water. The form of this balcony and of the masonry brackets that support it is sufficiently graceful to lend a certain beauty to the otherwise simple lines of the building. The cans once filled, were lifted in true southern style to the heads of women and balanced nicely on a sort of turban of wet rag that is applied to the crown of the head for this purpose. Those who have not seen can hardly appreciate the ease with which even unstable loads can be carried in this manner. For instance, I have seen a South American Indian girl carry a quart bottle filled with milk, simply standing it upon her head. To them it is an every day matter. One recalls the English contractor on an Indian railway-cutting who thought humanely to substitute wheelbarrows for the baskets in which the coolies carried the excavated earth on their heads. On visiting the cut, to observe the result of his innovation, he found the navvies *carrying the loaded barrows on their heads!*

The well, as a centre of common necessities, is one of the liveliest points on the island. Of course women predominate as drawers of water.

The physical types vary between pure African and Portuguese, but visitors of every nationality may be met with at any time, as all the English, German and Italian steamship lines take this convenient place for their coaling station on the South American voyages. The French, of course, prefer their own station at Dakar on the African coast opposite.

Passing down the well-paved streets—there are no horses nor carts—we were invited by a sentinel to visit the jail. We stepped in. The building differed from the usual residence only in having wooden and iron bars across its doorways. Standing in the corridor, we could converse with the prisoners inside about the reason and length of their imprisonment. They were cheerful and no worse appearing than the usual run of the inhabitants, nor did they seem to feel shame at being thus made objects of curiosity, rather availing themselves of the opportunity to beg the visitor for small coins or tobacco. Of course the impassive jailors expect to share in this bounty.

But most striking among the sights of San Vicente to our eyes was the Cammoens school, where an aged negress, dressed in the most spotless white, presided over two rooms full of bright, neatly dressed little girls, daughters of the richer class among the islanders. There were no benches; only chairs in no fixed order.

The height of the room, occupying the whole one story of the building, the size of the windows, hung with curtains of matting, and the contrast of coolness and neatness within to the heat and dirt of the street without, combined to make the school one of the most attractive I ever saw. The little girls in one room seemed to be having a recess as we entered, and crowded fearlessly about us, eager to know from what country we came and in what steamer, being too well acquainted with such visitors to wonder at our presence. We were a party of a dozen gentlemen, Spaniards all except myself, and all a good deal older than I. Doubtless the teacher thought the party was all of Spaniards. I am sure the lesson that followed would not have been given had she known that a North American was present. It turned on the character and disposition of the English people, apparently part of a Geography lesson. It came out that the English were cruel and bloodthirsty. As evidence was cited the habit of English boys who differed in opinion of going off behind the school, as like as not under the escort and advice of some of the older boys, to beat each other about the face with their bare hands until their eyes were blackened and their noses bled. So too the grown up people paid large sums of money to see savage, half naked men fight with their fists for a prize. And the Americans had much the same habits. Prize-fights there attracted great numbers of wealthy and influential people, the governors of many states never failing to attend!

(Ten years later I was visiting a school in the town of Concord, Massachusetts and chanced into the geography class where the teacher was bringing out the inherent savageness and brutality of the Spaniards. She cited the bull-fights as evidence; how the people enjoyed seeing the angry bull tearing open with his sharp horns poor old horses that had not spirit enough to escape, only to be slain in his turn by a highly trained and well armed man, who gave him equally little chance for his life! How the occasion was a holiday one, the day being Sunday or some other festival and the world of society turning out in its gayest attire to see the event, even the queen of Spain herself. Both teachers ladies of dignity and charm and both instilling into children's minds the poison of an elementary contempt and hatred of the foreigner.)

A nod to the teacher, an *Adios* to the children, and we are off to the bay, where the Aquila lies darkly silhouetted against the pale blue outline of distant San Antonio.

The area of California, 158,297 square miles, is approximately equal to the combined area of Roumania, Bulgaria, Servia, Albania, Montenegro, Belgium, and Turkey in Europe.

The population of California, according to the latest census, was 2,377,000, as against 28,532,000 for the European countries named.

Of California's total area, it is of interest to note that 70 per cent has already been topographically mapped by the United States Geological Survey.

MATERIAL FOR USE IN SCHOOLS

Supplied by the U. S. Department of Agriculture, Forest Service.
Washington, D. C.

For Free Distribution

Farmers' Bulletins—

173—A Primer of Forestry, Part I
358—A Primer of Forestry, Part II
423—Forest Nurseries for Schools
134—Tree Planting on Rural School Grounds
228—Forest Planting and Farm Management

Forest Service Pamphlets—

The Country's Forests
Our Timber Supply

Maps—

Natural Forest Regions of North America (16″x20″, paper).
National Forests of the United States (21″x33″, paper) (5′x7′, paper).

Material Which May Be Had Temporarily as Loans

Traveling Exhibit of Commercially Important Woods of the United States.

The Forest Service has prepared sets of sixty-four samples of commercially important woods of the United States, together with maps showing the region in which each species grows and a short statement of its principal uses and physical characteristics, for loan to schools, libraries, and other educational institutions. Four wood samples are arranged on a photographic mount measuring 16½x10 inches, and these mounts are affixed four on each of four strips of green denim, with eyelets in upper corners for hanging. The whole exhibit covers a wall space about four feet high by six feet long.

This exhibit is loaned for short periods under agreement with the borrower that he pay transportation charges and forward it promptly to the next place of exhibition at the direction of the Forest Service. The exhibit, wrapped for shipment, weighs about nine pounds.

Application for the loan of this exhibit should be made directly to the Forester, U. S. Department of Agriculture, Washington, D. C.

Traveling Photograph Exhibit

A special collection of 44 large mounted photographs on "The Forests of the United States, Their Use and Preservation," has been prepared as a traveling exhibit to be loaned to schools, libraries, and other educational institutions. These photographs are arranged in 11 series of 4 pictures each. These series, with their descriptions, form illustrated "stories" on special features of forest work and forest conditions. Each series is mounted on a strip of green denim cloth, with eyelets in the upper corners, for hanging. The whole exhibit covers a wall space 4½ feet high and about 14 feet long.

This exhibit is loaned for short periods on condition that the borrower agrees to pay express charges and to forward the pictures promptly to the next place of exhibition at the direction of the Forest Service. The exhibit wrapped for shipment weighs about 18 pounds. Applicants for the pictures should write directly to The Forester, U. S. Department of Agriculture, Washington, D. C., and ask that a reservation be made.

Special Lantern Slide Sets

Several special sets of colored lantern slides have been prepared for educational use, some of general interest, some of special interest to teachers. Each set is accompanied by a syllabus for a lecture. These slides will be loaned for short periods, on condition that the borrower agrees to pay transportation charges from Washington and return, and to be responsible for slides lost or broken. The subjects upon which special sets are available are as follows:

Of General Interest—

General Forestry
Conservation of the Forest
The Work of the Forest Service
The Care and Protection of Shade Trees

For Special Use in Schools—

Nature Study and Forestry
Botany and Forestry
Manual Training and Forestry
Geography and Forestry
Agriculture and Forestry

Persons wishing to borrow any of these sets should make application for them as long as possible before the date on which they are needed, so that reservations can be made.

Material which may be purchased—

Publications—Any of the publications of the Forest Service in print may be secured by purchase, in any quantities desired, from the Superintendent of Documents, Government Printing Office, Washington, D. C. He will furnish a price list on request.

Among the publications recommended for school use, of which the supply available for *free* distribution is exhausted, are the following:

Forest Service Circulars—

No. 96—Arbor Day ..... .05
No. 130—Forestry in the Public Schools..... .05
No. 171—The Forests of the United States, Their Use..... .05

Office of Experiment Station Circular—

No. 117—A Working Erosion Model for Schools..... .05

Price List of Photographic Material

Under Act of Congress, approved June 30, 1906, the Forest Service is

authorized to sell photographic prints, lantern slides, bromide enlargements and transparencies. The prices at which this material can be sold are given below. Payment for all material made for sale is required in advance. Remittances should be made by Postal money order or bank draft drawn in favor of "The Treasurer of the United States," but mailed to the Forest Service. Requisitions should be placed as far in advance as possible, since material for sale can be made only as the regular work of the Photographer of the Forest Service will permit.

Price List of Photographic Work—

Photographic Prints:

Size	Unmounted	Mounted
4 x5	$0.06 each	$0.08 each
4¼x6½	.07 each	.09 each
5 x7	.08 each	.10 each
6½x8½	.11 each	.14 each
8 x10	.17 each	.20 each
Lantern Slides	35c each uncolored	
Bromide Enlargements	.003 per square inch	
Bromide Enlargements (Sepia)	.004 per square inch	
Transparencies	.015 per square inch	
Coloring Lantern Slides	65c each	
Coloring Bromide Enlargements	.01 per square inch	
Coloring Transparencies	.02 per square inch	

Prospective purchasers of photographic material should submit a list of subjects to be illustrated, giving the number of prints desired on each subject, and stating as fully as possible the character of the pictures wanted. If prints are to be ordered, the size preferred should also be stated. A careful selection of the negatives will then be made and a list submitted to the purchaser with a statement of the cost of furnishing the material.

CURRENT GEOGRAPHICAL NOTES

The Yukon River

The Yukon River in Alaska is one of the great rivers of the North American continent. A brief report on the discharge of this river at Eagle, Alaska, by E. A. Porter and R. W. Davenport, has been issued by the United States Geological Survey as Water-Supply Paper 345-F. Probably few people have an adequate conception of the size of this river and characteristics of its flow. A. H. Brooks, of the Geological Survey, gives the Yukon fifth place among the large rivers in North America and estimates its drainage area at about 330,000 square miles. Its length, including the Lewes and Teslin rivers, is given in the report as 3,200 miles. The discharge of the Yukon varies from a maximum of 254,000 to a minimum of 10,100 cubic feet a second, or an esti-

mated average flow of 73,200 cubic feet. This is a relatively small discharge, the average flow of the Mississippi being 695,000, that of the Ohio 300,000, and that of the Colorado 23,300 second-feet. The Nile, with a drainage area of 1,262,000 square miles, has an average flow of 116,000 cubic feet a second. The flow of the Yukon is therefore relatively small as related to its drainage area.

Enormous Rainfall in Hawaii

The rainfall on the island of Hawaii varies greatly, ranging from the enormous downpour of 353 inches a year in the upper Waipio Valley to 20 inches on some of the slopes of Hualalai. The only surface streams on the island are found along the northeast coast between Hilo and Kohala. Waipio River, according to the United States Geological Survey, is the largest stream on the island and has been partly developed for irrigation. At Kapoho, on the east point of the island, warm water flows from seams in the rocks. These "warm springs" flow into a pool about 100 feet long, 25 feet wide, and 20 feet deep. The pool is entirely surrounded by rocks and its color varies in shade from a beautiful blue to violet. Waiapele, or Green Lake, is a body of fresh water in the pit of an old crater near Kapoho. This lake covers an area of about 5 acres and is fed by springs below the surface. A pumping plant takes water from this lake for domestic use and for irrigations.

New Map of Montana Issued by U. S. Geological Survey

By international agreement the United States and nearly all the other principal countries of the world in 1909 planned for the preparation of maps of the entire surface of the earth, to be published on a scale one-millionth of actual size, or about 1 inch to every 16 miles, the United States Geological Survey undertaking to prepare the United States portion. All the maps are to be uniform in shape and general appearance and are to have the same conventional signs.

As the majority of the people in this country have more or less use for State maps than for maps of any other kind the Geological Survey decided to utilize the data collected by publishing also maps of each State on a larger scale—about 1 inch to every 8 miles. A map of the entire United States on this scale would cover a sheet 20 by 31 feet.

The Survey has already issued 25 such State maps, the latest one being that of Montana, and this is the largest one of the series so far published. In compiling the map every available source of information has been ransacked for material, and many data never before available to the public in any form have been procured, so that the map far exceeds in accuracy any heretofore published. The map is in two sheets, each 40 by 46 inches, and is sold and delivered free by the Geological Survey for the nominal price of 45 cents.

Hawaiian Volcanoes

The lofty volcanoes of the Hawaiian Islands, rising above the ocean from 5,000 to nearly 14,000 feet, are only the summits of gigantic mountain

masses that rise abruptly from the bottom of the Pacific. Mauna Loa, on the island of Hawaii, stands 13,675 feet above sea level, according to the United States Geological Survey, but its slopes descend beneath the sea, as shown by deep-sea soundings, with a grade fully equal to if not greater than that of the visible slopes. The same is generally true of the submarine slopes of the other islands, and the depths attained by these continuous slopes, within 30 to 50 miles of the shores, vary from 14,000 to 19,000 feet. Mauna Loa and Mauna Kea, if their true bases are considered to be at the bottom of the Pacific, are therefore mountains of as great an altitude as Mount Everest, or approximately 30,000 feet. In general the Hawaiian Island group consists of summits of a gigantic submarine mountain chain which projects only its loftier peaks and domes above the water. On the island of Hawaii the volcanic forces are still in operation.

The one continuously active volcanic vent of the island is Kilauea, far down on the eastern flank of Mauna Loa—"the great mountain." No other volcano in the world approaches Mauna Loa in the vastness of its mass or in the magnitude of its eruptive activity. There are many volcanic peaks higher in the air, but most of them are planted upon elevated platforms, where they appear as mere cones of greater or less size. It is not yet known at what level the base of Mauna Loa is situated, but it is below the sea—probably far below.

Mauna Kea—"the white mountain"—is also a colossus among volcanoes. Its summit—13,825 feet—is a trifle higher than that of Mauna Loa, but its slopes are steeper and its base is therefore much smaller. The magnitude of Mauna Loa is due chiefly to the great area of its base, which is nearly elliptical in shape, with a major diameter of 74 miles and a minor diameter of 53 miles, measured at sea level.

In the aggregate of its eruptions Mauna Loa is also unrivaled. Some of the volcanoes of Iceland have been known to disgorge at a single outbreak masses of lava fully equal to those of Mauna Loa. But such outbursts are infrequent in Iceland, and a century has elapsed since any of such magnitude have occurred, though there have been several minor eruptions. The eruptions of Mauna Loa are all of great volume and occur irregularly, at an average interval of about eight years. In view of the total quantity of material it has disgorged during the last century, no other volcano is at all comparable to it.

Mauna Loa and Kilauea are in many respects abnormal volcanoes. The most notable feature is the singular quietness of their eruptions. Rarely are these events attended by any of that extremely explosive action which is characteristic of nearly all other volcanoes. Only once or twice within the historic period have they been accompanied by earthquakes or subterranean rumblings. The vast jets of steam blown miles high, hurling stones, cinders, and lapilli far and wide, filling the heavens with vapor and smoke, and hailing down ashes and fragments over the surrounding regions, have never been observed here. Some action of this sort is indeed represented, but only in a feeble way. The lava wells forth like water from a hot, bubbling spring, but so mild are the

explosive forces that the observer may stand to the windward of the grandest eruption, so near the source that the heat will make his face tingle, yet without danger. Ordinarily the outbreak takes place without warning and without the knowledge of the inhabitants, who first become aware of it at nightfall, when the sky is aglow and the fiery fountains are seen playing. As the news spreads, hundreds of people flock to witness the sublime spectacle, displaying almost as much eagerness to approach the scene of an eruption as the people of other countries show to get away from one.

Chile and Argentina

Clippings from Prof. E. A. Ross's fourth paper on "South of Panama" in the Century for February—

"In Valparaiso one is struck with the signs of English influence: on the commercial streets every third man suggests the Briton."

"The central valley running north and south for two hundred miles * * * is the heart of Chile."

"This is a land of great estates, held chiefly by absentees, and its produce goes not to sustain a fine rural life but to keep up a house in a provincial capital, or a mud-and-marble mansion in Santiago.

"The best thing in Chile is the horse * * * the worst thing in Chile is the roads.

"About 30 years ago a stream of German immigration laved southern Chile. * * * The country abounds in fine farm houses and big barns like those of the Germans in Wisconsin. * * * In every case the mayor is a German, elected by Chilean votes, for the Germans enjoy a great reputation for probity in public office."

"As a laborer the Chilean has good points—physical endurance and energy; but he must have direction, and working on his own place for himself, he is fitful."

"After a night's run we woke half way across Argentina. The pampa is amazingly level—as flat as the flattest prairies of Illinois. Channels, erosions, or other signs of running water there are none. In one hundred and fifty miles I noticed not one bridge or culvert on the railway."

"Buenos Aires, with its million and a half inhabitants, is a veritable Niagara of human power."

"Argentina has the future of a white man's country; * * * the proportion of the blood of the Argentine people which is non-Caucasian certainly does not exceed five per cent. * * * No people of the Western Hemisphere, save the Canadians, is racially so European as the population of Argentina."

"While Argentina has in store growth and prosperity, I do not look for her people to manifest as much force of character as the American people at the corresponding stage."